(accept, format, manage)

A current, sophisticated graphics-terminal system can "create," store, retrieve, and display on a CRT text and graphics (points/lines) simultaneously to an operator who "interacts" with it to correct and manipulate the material into a form suitable for output (plotting, printing transmission, other magnetic or paper (tape) storage, or continued display)

Potentially, it can edit (process) text, by checking grammar, spellin punctuation, format, feadability, content, completeness -- many involving operator help and considerable core memory! --functions that require subordinate functions to move, insert, delete letters(symbols)/words/ sentences/page/pages and perhaps even select type styles and sizes and move, insert, and delete graphic forms, but the latter is more correctly classed as graphics manipulatinn than as text editing.

It can create rapidly two- and three-dimensional graphics from points, lines, and programs that employ assigned coordinates, then combine and simultaneously manipulate two or more of these graphics. It can even create the shadow of an object by using the date, time, and geographic coordinates of the object to get the sun position relative to the object, for shadow analysis.

It allows rapid input and maintenance of system files and if the display tube is big enough, it can be used for briefing small groups. An additional and desirable quality of taking what is displayed on the CRT and projecting it off onto a larger, perhaps wall-size, screen is not yet possible.

Potential tasks for it include those already mentioned -- text editing, file input/maintenance, object/shadow analysis, object identificati by superimposing its photographic image on the graphic display, scaled and oriented to match the photograph; checking the fit or correlation of two objects (by combining two displays on CRT and perhaps measuring 'em); checking/correcting graphics; analyzing collateral information (represented as target symbols on a map or located by geographic coordinates)*; preparing graphics; typesetting (selecting the proper type style and size, line length, etc.); cable preparation (text-editing the material and then putting it out on papertape/magtape for communications devices); mensuration (measurement))designed to rectify the view as seen by an analyst, by reading data in, rectifying it, and plotting it on a display device (perhaps a plotter); tumbling, rolling, displaying an object/image from different points of view -- to view objects put together or synthetically as an aid to deduction by reasoning from single, simple elements toward the more complex whole of several elements combined.

Graphics terminals and systems containing all or most of the above functions now cost upwards of $40-50,000, and require extensive software development--programming rarely supplied by the manufacturer to fit a specific application (and "tailoring" the manufacturer's software to fit, if possible, is generally quite expensive-- upwards of $80-100,000/ Moreover, such systems typically require considerable core storage (well over 100K words/4-500K characters) and, because of the large amounts of input/output activity and operator "wait" time, often a dedicated computer!

Where possible, production offices interested in computer graphics applications, would do well to let large, well-financed R&D outfits do the R&D, wait for "off-the-shelf" systems whose hardware/softwar is supplied and well-supported (including inexpensive "tailoring") by the manufacturers, and also pool their efforts for comparative evaluations, tests, and selections of systems.

*These systems may be of especial help in correlating collateral data and in visualizing and interpreting large data bases, because points/lines/ symbols can represent much more data than for visual pattern recognition than (can words).

--Objects such as lines of communication, installations, etc., can be related to each other and to topography and geographic features

Some display devices (BR-90) allow the simultaneous display of alphanumeric, graphic, symbols/points/lines as well as the rear-projection of slides on their display screens.

They use for input the normal typewriter-type keyboard, plus light-pe and function keys to enter data and commands, and balls/sticks to manipulate their cursors.

At present digitized map data (geographic-feature points and lin are available as well as other kinds of data, so that future systems may be able to tie into a map library in memory and allow much flexibility in terms of the features, projections, and scales projected. Non-impact printers (electrostatic) may soon permit the fast printout of a map and superimposed graphics and textual data

Took little is known about whether analysts can expect to get insights through the visual recognition afforded by the display of large amounts of data on maps, about the overall interactive mode of these systems, and about the role of graphics -- present resolutions (of terminal is insufficient for fine detail work, and generally give more than is needed for mere spatial cognition (while with rear-projections the changes of scale and other features are limited) to consider these systems for analytical help as other than experimental -- and very costly experiments, at that!

To analyze a graphics terminal (GT), there's no need to detail how it does what it does, but initially we need only look at its cost, functions, and at those problems that might be solved by some combination of its functions.

The first function we might note is its ability to display latters and numbers ---as words or strings of symbols -- corresponding to their representations stored in the memory of an associated computer.

Close to this function is that of accepting commands from an operator that point out or designate specific parts of the displays, and that call up computer programs to be performed upon the displays. The result is that the system can "edit" text or graphic displays. Many text-editing systems exist, some at a fairly low cost -- when they limit themselves to alphanumeric(letter/number) rather than graphic displays and keep the editing functions limited, too(Terminals can cost$3-5000 and the systems $).

When a graphic display and editing system is built (added to the text-editing system as the more ambitious manfacturers do), costs rise steeply (terminals frequently range above $50,000 and the associated hardware/software costs run into the hundred-thousands. Text-editing subsystems are often included for text-editing (which don't really use the graphics capability and are hence perhapp an unnecessary expense), for the preparation of programs (computer) associated with graphics manipulation (necessixty of this assocaition is doubtful, except for the manafacturer or system-software supplier), aor the annotation of graphics.

The more significant functions of graphic-display systems are its abilities to do the following things:

-Display points/lines-line segments/symbols stored in bit patterns in memory;
-Accept keyed commands or programmed commands that single out specific parts of the display or subsets of the set displayed.
-Accept commands that modify the scale or positioning of the things displayed;
-Accept commands that call up computer programs (FUNCTION SWITCHes) that take as their inputs the sets or subsets of points/lines already resident in memory. Most of these programs provide three-dimensional projections and image-manipulations or tumbling rolling of a sort. Their operation may be speeded by a system of hard-wired matrix operations not found in most terminals.

An analyst can enter the digital representations of something (object point/line/symbol) he is trying to identify into the system (or it can be entered from a file of such "somethings" beforehand for the novice analy analyst!) and then use the system to view the thing from other points of view so that he could decide what it truly was, if in doubt. A fallacy in the "science" of this approach is that by supplying (three) coordinates for each part of the thing (the third may be supplied implicitly as well as explicitly -- or even by system programs!), he makes some judgment about what the thing is in the first place! / reps. of three-dimensiona

Another approach is to have a data base containing/objects whose images the analyst might encounter. Faced with something he didn't recognize, he'd call up a "probable" or a "possible" thing and turn it around until it looked like the thing he didn't recognize. Does one really need such a capability?

Comment on above comments.

To distinguish between editing systems, please note that one meaning formulated by editors is that it consists of those things that editors do--checking grammar, spelling, punctuation, format, readability, content, completeness, etc and require the movement, insertion, deletion, etc of words, sentences, paras, pages, reports(-- not to mention letters?). The other definition, by ADP salesmen, means the insertion and deletion of character/words and sometimes the ability to delete a line, part or whole of a page. These functions plus a few others (? which are?) often advertised asfull editing. Sophisticated text-editing systems far surpass these advertised and sold more cheaply.

Such things as spelling checks may be important to some organizations (But need they be donw by machine?)- cheap core memory isn't here yet

To define the shapes of newly encountered objects, one does not just supply the three coordinates for a part of the image, making thereby some judgment about its configuration -- but uses more than one image of the unidentified object (different snapshots of the same, specific object!) or a snapshot/snapshots of several identical or similar objects at different angles with respect to each other. Then he uses them and their shadows to define the three-dimensional boundaries within which the trud shape of the object lies. This process is iterative and may require severa or many images/representations/snapshots to complete. (Does the system allow for measurement, calling up measurement programs? Or, what kind of accuracy/precision can one expect from it?) Is accuracy needed? Where? How much? Precision?

A hologram, conversely, requires an actual object or a three-dimensio al model of it. If either of these is available, then one doesn't need the

graphic display. But holograms, don't afford you a complete view of the object. They pmerely present a three-dimensional view of one side of t object so that you may move from side to side to get some additional information beyond that afforded by a single, fixed vinwpoint.

As to fitting objects togethwer, we are interested not just in whetel one object fits into/with another, but how well(= accuracy/presision = meaeurement?)- see comment above?? What tie-in to accuracy/measurement/ precision has the system?)